

PATENT COOPERATION TREATY

Rcvd. S. Rosenfield

From the INTERNATIONAL SEARCHING AUTHORITY

MAY 11 2005

To:
RICHARD E. ONEY
FENNEMORE CRAIG
3003 NORTH CENTRAL, SUITE 2600
PHOENIX, AZ 85012-2913

PCT Action _____

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 12504-514		Date of Mailing (day/month/year) 06 MAY 2005
International application No. PCT/US04/18968		International filing date (day/month/year) 14 June 2004 (14.06.2004)
Applicant ARIZONA BOARD OF REGENTS		

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

Where? Directly to the International Bureau of WIPO, 34, chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90 bis.1 and 90 bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer Richard Elms Telephone No. 571.272.1869
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Form PCT/ISA/220 (April 2002)

(See notes on accompanying sheet)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 12504-514	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US04/18968	International filing date (<i>day/month/year</i>) 14 June 2004 (14.06.2004)	(Earliest) Priority Date (<i>day/month/year</i>) 13 June 2003 (13.06.2003)
Applicant ARIZONA BOARD OF REGENTS		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the Report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐

the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐

contained in the international application in written form.

☐

filed together with the international application in computer readable form.

☐

furnished subsequently to this Authority in written form.

☐

furnished subsequently to this Authority in computer readable form.

☐

the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐

the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (See Box II).

4. With regard to the title,

☒

the text is approved as submitted by the applicant.

☐

the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒

the text is approved as submitted by the applicant.

☐

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. _____

☐

as suggested by the applicant.

☐

because the applicant failed to suggest a figure.

☐

because this figure better characterizes the invention.

☒

None of the figures

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/18968

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01L 21/22, 21/38

US CL : 438/565

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 438/565, 507, 508, 510, 511, 569

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST 2.1.4, IEEE XPLORE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/0157787 A1 (MURTHY et al) 21 August 2003 (21.08.2003), paragraphs [0039] and [0040].	19-22
X	US 5,532,183 (SUGAWARA) 2 July 1996 (2.07.1996), column 1, lines 55-60; column 3, lines 22-28; column 3, lines 41-57.	19-22
A	US 5,198,387 (TANG) 30 March 1993 (30.03.1993).	1-25
A	US 5,714,415 (OGURO) 3 February 1998 (3.02.1998).	1-25
A	US 6,410,434 (MANI) 25 June 2002 (25.06.2002).	1-25
A	US 6,723,621 B1 (CARDONE et al) 20 April 2004 (20.04.2004).	1-25

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

12 November 2004 (12.11.2004)

Date of mailing of the international search report

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Facsimile No. (703)305-3230

Authorized officer

Richard Elms

Telephone No. 571.272.1869

[Signature]
FAR

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
RICHARD E. ONEY
FENNEMORE CRAIG
3003 NORTH CENTRAL, SUITE 2600
PHOENIX, AZ 85012-2913

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Applicant's or agent's file reference 12504-514		Date of mailing (day/month/year) 06 MAY 2005	
International application No. PCT/US04/18968		International filing date (day/month/year) 14 June 2004 (14.06.2004)	
International Patent Classification (IPC) or both national classification and IPC IPC(7): H01L 21/22, 21/38 and US Cl.: 438/565		Priority date (day/month/year) 13 June 2003 (13.06.2003)	
Applicant Applicant			

1. This opinion contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|--|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the opinion |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input checked="" type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application |

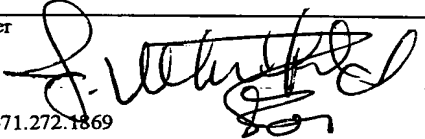
2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer Richard Elms  Telephone No. 571.272.1869
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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US04/18968

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US04/18968

Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-18, 23-25	YES
	Claims 19-22	NO
Inventive step (IS)	Claims 1-18, 23-25	YES
	Claims 19-22	NO
Industrial applicability (IA)	Claims 1-25	YES
	Claims NONE	NO

2. Citations and explanations:

Claim 1-25 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in the semiconductor industry.

Claims 1-18 and 23-25 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest a method for synthesizing a compound having the formula $E(\text{GeH}_3)_3$ wherein E is selected from the group consisting of arsenic (As), antimony (Sb) and phosphorus (P), the method comprising combining GeH_3Br with $[(\text{CH}_3)_3\text{Si}]_3\text{E}$ under conditions where $E(\text{GeH}_3)_3$ is obtained, according to the formula $3 \text{GeH}_3\text{Br} + [(\text{CH}_3)_3\text{Si}]_3\text{E} \rightarrow (\text{CH}_3)_3\text{SiBr} + E(\text{GeH}_3)_3$; a method for doping a region of a semiconductor material in a chemical vapor deposition reaction chamber, the method comprising introducing into the chamber a gaseous precursor having the formula $E(\text{GeH}_3)_3$, wherein E is selected from the group consisting of arsenic (As), antimony (Sb) and phosphorus (P); a method for depositing a doped epitaxial Ge-Sn layer on a substrate in a chemical deposition reaction chamber, the method comprising introducing into the chamber a gaseous precursor comprising SnD_4 mixed in H_2 under conditions whereby the epitaxial Ge-Sn layer is formed on the substrate; and introducing into the chamber a gaseous precursor having the formula $E(\text{GeH}_3)_3$, wherein E is selected from the group consisting of arsenic (As), antimony (Sb) and phosphorus (P); a method of preparing $(\text{E})\text{H}_x(\text{GeH}_3)_{3-x}$ where $x = 1$ or 2 and E is selected from the group consisting of P, As, Sb, the method comprising reacting inorganic or organometallic compounds of the E element with an alkali germlyl or a halogenated germane.

Claims 19-22 lack novelty under PCT Article 33(2) as being anticipated by Murthy et al and Sugawara. Murthy et al. and Sugawara teach the claimed method for forming a Group IV semiconductor film.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US04/18968

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claims 19, 20, 21, and 23 are objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: claim 19, line 2 needs ~~film~~ inserted after "semiconductor"; claim 20 needs a period at the end of the claim; claim 21, line 2 "v" needs to be deleted; claim 23, line 3, "orhanometallic" needs to be replaced with ~~organometallic~~.

The description is objected to as containing the following defect(s) under PCT Rule 66.2(a)(iii) in the form or contents thereof: paragraph [0034], line 6 organometallic is misspelled as "orhanometallic"; in the Abstract, line 1, first use of "for" needs to be deleted.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US04/18968

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claim 22 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 22 is indefinite for the following reason(s): the last line recites "together with at least SnD_4 , GeH_4 , Ge_2H_6 " but does not state whether it is --and Ge_2H_6 -- or -- or Ge_2H_6 --. The claim was examined as --or Ge_2H_6 --.